

Status of the Claims

The listing of claims will replace all prior versions, and listings of claims in the application.

1. (previously presented) A method of characterizing an optical system comprising:

projecting an image of a reticle, positioned in a reticle plane and having a plurality of periodic pattern features thereon, with the optical system;

detecting the image of the plurality of periodic pattern features in a plane oblique to the reticle plane; and

analyzing the image of the plurality of periodic pattern features to obtain information characterizing the optical system.

2. (previously presented) A method of characterizing an optical system as in claim 1 wherein:

the plurality of periodic pattern features comprises a grating.

3. (previously presented) A method of characterizing an optical system as in claim 1 wherein:

the plurality of periodic pattern features are a plurality of gratings.

4. (original) A method of characterizing an optical system as in claim 3 wherein:

the plurality of gratings comprises basket weaves, vertical lines, horizontal lines, and tilted lines.

5. (original) A method of characterizing an optical system as in claim 4 wherein:

a central portion is formed of repeating vertical lines, horizontal lines, and tilted lines.

6. (original) A method of characterizing an optical system as in claim 5, wherein:
the central portion is bounded by basket weaves.

7. (original) A method of characterizing an optical system as in claim 1 wherein:
the image is recorded on a photosensitive substrate.

8. (previously presented) A method of characterizing an optical system having an
optical axis comprising:

projecting an image of a reticle having a plurality of periodic pattern
features therein through the optical system;

detecting the image of the reticle simultaneously at different locations and
in a direction coaxial with the optical axis; and

analyzing the image to obtain characterization of the optical system.

9. (previously presented) A method of characterizing an optical system as in
claim 8 wherein:

the plurality of periodic pattern features comprise a plurality of rows of vertical,
horizontal, and tilted lines.

10. (original) A method of characterizing an optical system as in claim 8 where:
the step of analyzing comprises using interferometry.

11. (currently amended) A method of extracting optical parameters from an optical system having an optical axis comprising the steps of:

illuminating periodic patterns in an object plane of an object space of the optical system, the object plane extending over a range of depths through the object space;

imaging the periodic patterns via the optical system;

intercepting and recording the image of the periodic patterns in an image volume of the optical system; and

analyzing a recorded image of the periodic patterns formed within the image volume,

whereby optical system parameters are extracted.

12. (original) A method of extracting optical parameters from an optical system as in claim 11 wherein:

the recorded image is tilted within the image volume.

13. (original) A method of extracting optical parameters from an optical system as in claim 11 wherein:

the object plane is tilted with respect to the optical axis,

whereby a continuum of object positions as a function of field position is generated.

14. (original) A method of extracting optical parameters from an optical system as in claim 13 wherein:

the recorded image is tilted with respect to the optical axis.

15. (original) A method of extracting optical parameters from an optical system as in claim 11 wherein:

the object plane and the recorded image are tilted orthogonally with respect to each other,

whereby a continuum of object positions in one axis and focus positions in another orthogonal axis is generated.

16. (original) A method of extracting optical parameters from an optical system as in claim 12 wherein:

an envelope of feature resolution through focus is extracted.

17. (original) A method of extracting optical parameters from an optical system as in claim 12 wherein:

astigmatism of the optical system is extracted as a function of periodic pattern orientation.

18. (original) A method of extracting optical parameters from an optical system as in claim 12 wherein:

coma of the optical system is extracted as a second order distortion signature versus focus mapped across the field.

19. (original) A method of extracting optical parameters from an optical system as in claim 12 wherein:

spherical aberration of the optical system is extracted as a function of best focus difference between line sizes of the periodic pattern versus field position.

20. (original) A method of extracting optical parameters from an optical system as in claim 12 wherein:

optimum reticle or object position is extracted as a function of field position of minimum spherical aberration as seen by minimum best focus difference between line sizes.

21. (original) A method of extracting optical parameters from an optical system as in claim 11 wherein:

the recorded image is analyzed using a dark field microscope.

22. (original) A method of extracting optical parameters from an optical system as in claim 11 wherein:

the recorded image is analyzed using white light.

23. (original) A method of extracting optical parameters from an optical system as in claim 11 wherein:

the recorded image is analyzed using a laser microscopic interferometer.

24. (original) A method of extracting optical parameters from an optical system as in claim 11 wherein:

the recorded image is analyzed in a single exposure using a large aperture interferometer.

25. (original) A method of extracting optical parameters from an optical system as in claim 11 wherein the act of analyzing further comprises:

calculating best focus position.

26. (original) A method of extracting optical parameters from an optical system as in claim 11 wherein the act of analyzing further comprises:

calculating spherical aberrations.

27. (previously presented) An apparatus for characterizing an optical system comprising:

an optical system;

illumination means for projecting an image of a reticle having a plurality of periodic pattern features thereon within a volume of image space;

means for detecting the image at different locations comprising different depths of focus within the volume of image space;

means for analyzing the image and determining optical system imaging characteristics.

28. (Original) An apparatus for characterizing an optical system as in claim 27 wherein:

said means for analyzing the image and determining optical system imaging characteristics comprises analyzing interference patterns created by the image.

Claims 29-38 (cancelled)